Rebuild Massachusetts

REBUILD MASSACHUSETTS

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INSIDE THIS ISSUE

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THE SUSTAINABLE ENERGY CHALLENGE – AN ALLEGORY

Providing guidance on how to reduce the consumption of fossil fuel in buildings and other such vertical assets is a challenge. Instead of plunging headlong into the depths of building energy management and science, this guidance will introduce the topic by way of an allegory that stars another major energy consumer, the car.

Others, including the bus, the truck, the train, the boat, the manufacturing plant, and the extractive industry, auditioned for this allegory, but the car won because of our relationship with it. In fact, the authors are confident our relationship with our car is even more personal than that with any vertical asset.

Deciding who would play the driver in this allegory was more vexing. Would a Chief Executive be better than a Facility Manager? Should we go generic and advertise for an overseer? After much consideration, we finally concluded that the best choice would be **You**.

To join You in this allegory are four other characters: Leader, Conservation, Efficiency, and Renewable. Another figure is Petroleum, but since he never appears on the stage, we'll relegate Petroleum to play a commodity.

With these introductions, we are pleased to present –

The Sustainable Energy Challenge – An Allegory

Working around your house on a weekend afternoon, you see your Leader bicycle up to Your house and stop behind Your Car. The Leader says, "Hello, how are You?"

You reply fine and inquire about what is new.

The Leader declaims, "The amount of Petroleum that we are using in our Cars is causing economic and environmental havoc. To mitigate these problems I challenge You to use 15% less Petroleum in Your Car this year."

We need to close the curtain on the allegory for just a moment because responding to a challenge raises the question of what motivates the challenged, You, in this case. We recognize that You have a unique motivational criterion. Neither wanting to risk providing the wrong criterion nor having the space to provide all the criteria, we ask that You rely on Your imagination to pick a motivation. If you need some help, we can offer two motivational theories: 1) Reward-Punishment; and 2) Victory-Defeat. Each of these theories requires you to decide whether You are more motivated by achieving the one, Reward or Victory, or avoiding the other, Punishment or Defeat. We would also like to point out that the first theory requires that you reify the reward or punishment. The consequences of second theory are purely emotional, thrill or agony.

As soon as You're ready, we'll raise the curtain.

Despite being surfeit with motivation yet realizing You lack the wisdom to take the challenge, with great eloquence, You accept the challenge, and with even greater humility, You ask for guidance.

Trying unsuccessfully to disguise a swelling emotion, in a tender voice the Leader speaks, "Even I am still learning the way of less Petroleum. You must start your journey with the knowledge of how much Petroleum you used last year and set your challenge's goal by multiplying last year's consumption by eighty-five percent."

Replying that You will do it is more to help Your Leader get over the emotional speed bump than to reaffirm that You are still onboard for this road trip.

With regained composure the Leader continues, “On your journeys you will have to keep records of how many gallons Your Car takes at each fill-up. Moreover, you must develop meaningful rates of consumption such as miles-per-gallons, gallons-per-day and miles-per-day et cetera in order to forecast whether or not you will succeed at the challenge.”

Seeing in Your face that You comprehend how to calculate these ratios but still lack the wisdom to find the road to less Petroleum consumption, Your Leader says, “Tonight set three extra places at your table. Your guests will be Conservation, Efficiency, and Renewable. They will describe for You a road map to Sustainable Energy. The more of their suggestions you put into practice, the more causes you make for succeeding at this challenge. Transforming the propositions of your guests into actions, you thus diminish Your dependence on Petroleum.”

This curtain drop is the last interruption. We have three-fold reasons for dropping it: 1) an observation of modesty; 2) a question of the literary criticism sort; and 3) a second and final request from Your imagination.

1) *Editors, after reading the last scene, suggested that Your Leader provide You with the amount of Petroleum that You consumed last year. This would foreshadow how the Leader would be able to assist you with this information for the Challenge. We declined. We felt that the allegory is Yours and that we did not want to draw attention away from that.*
2) *What attributes does Your Leader have? You may reread the allegory to see, but this effort will be in vain. You and You alone have the responsibility for choosing those attributes, as well as the attributes of Conservation, Efficiency, and Renewable. It is Your dinner party — You must decide the spirit of the banquet. Moreover, you may decide to have a blind date with Conservation and have Efficiency and Renewable come as a couple.*
3) *A final request from Your Imagination. We also ask that you decide whether the dinner will be formal, al fresco, or potluck (You can ask Your Leader for the phone numbers of Conservation, Efficiency, and Renewable). You may even decide to dine out.*

In any case, when we return to the allegory, we will only provide neutral descriptions and monologues for Conservation, Efficiency, and Renewable. Once you work out the meal and seating, we’ll raise the curtain and provide words for your guests.

Your Leader has left. The hour for dinner is nigh. Conservation dresses outdoor casual. Energy Efficiency’s attire is business formal. Renewable wears clothing woven with sunbeams.

Conservation begins: “You can call me Maintenance or Operation, if you want. But what’s in a name?”

“Maintenance is keeping Your tires properly inflated and Your engine tuned. You know, fluids checked, oil & filters changed, belts tightened. If Your steering is off, get that front end aligned. Some even claim that a well-waxed car gives a mpg-edge on the highway.”

“My nickname for Operation is Driving. My first principle of Driving is to go as far as You can go *not Driving* to diminish Your consumption of Petroleum. Hoof it. Ride a bike. Take the T. Even sharing a ride is what I’m all about.”

“But when Driving, idle only to obey traffic signals. Slowly accelerate and brake as well. On highways, driving with the windows up and air conditioning on emulates me best. And don’t exceed the speed limit. Remember 55 mph for better mpg.

“That’s enough about me for now. It’s really all about common sense becoming conventional wisdom.”

“Next time we meet, I’ll tell you about hypermiling. How far can Your tank take You?”

Efficiency then speaks up: “Think about me as Design and Dollars. A Design that let’s you use less Petroleum and leaves you with more Dollars. You might be asking Yourself, “What about Design?”

“Keep in mind these three words, light, sleek, and thrifty, when you think about me and Your next Car. The lighter the Car the less Petroleum You need to get it moving and keep it going. Sleekness means Your Car won’t be wasting Petroleum pushing the atmosphere around.”

“Hybrid mechanics is what thriftiness is about. Energy that was once waste heat to slow the car down is now stored in a battery with regenerative braking. Idling waste is also eliminated. A stopped hybrid’s engine does not operate.”

Renewable joins in: “I rely on both Conservation and Efficiency in order to maximize my contribution. I am in a state-of-the-art condition. Some Cars have bodies of photovoltaic panels to provide its energy, and others link hydrogen fuel cells with my name. In the second case, only when I produce the hydrogen is the vehicles motion sustainable.”

BON APETITE!

PERFORMANCE CONTRACTING FOR ENERGY EFFICIENT PROJECTS

Is your budget stretched? Are your systems in need of upgrading? Do your energy consumption costs offer potential for savings? Can you achieve payback of your investment within a reasonable time? Are you ready to enter a multi-year partnership with an Energy Services Company (ESCO)? If you answered 'yes' to these questions, then a ***performance contract*** may be a feasible way to finance your project.

Massachusetts law allows for a type of performance contracting (***Energy Management Services***) whereby public agencies may contract with an Energy Services Company (ESCO) for the provision of the installation of energy conservation measures if the primary purpose for doing so is to reduce energy or water consumption and improve the energy efficiency of a facility. This streamlined method for procuring energy management services is authorized by M.G.L. c25, §11c (allowing the use of a **Request for Response** to bid) or §11I (allowing the use of a **Response for Qualification** to bid). **A municipality may select either method based on the type of response they are seeking.**

Whichever method you select, knowing what you want is key. An essential consideration is the value the performance contract offers to the municipality. Because performance contracting is a financial arrangement, municipalities can determine the feasibility of a project by calculating the return on investment from the energy efficient upgrades and determining which projects have greater benefits than costs. The energy efficiency is pivotal to the process because it finances the project — a good performance-contracting proposal will take full advantage of every opportunity presented by the anticipated energy savings.

Consider the following when assessing whether financing a performance contract is feasible:

1. ***Identify the project:*** Performance contracting is a funding opportunity to finance a construction project and should be managed like any other construction project. Perform a preliminary examination of the facility's energy consumption history and the condition and age of things such as its lighting/HVAC equipment to assess whether the energy conservation measurements are economically viable. Local utilities can often be of assistance in this process.

2. ***Size of project investment***: the ESCO evaluates the circumstances for each project individually; the project's annual energy use and potential for savings will determine the ESCOs' interest in implementing an energy performance contracting arrangement — with some ESCOs willing to implement projects for smaller facilities, while others prefer large-scale projects. Aggregating a number of buildings usually produces a suitable project.

3. ***Multiple measures***: often performance contracts contain measures with short-term paybacks that offset improvements with long-term paybacks. This avoids 'cream skimming'. Energy conservation measures are good candidates when the expected life span of the measure exceeds its cost-recovery period.

4. ***Stable building use***: building use is another determinant of the efficacy of performance contracting. Improving buildings using this type of contract is generally more appropriate for buildings that have relatively stable use and occupancy during the contract period.

5. ***Length of financing term:*** the facility or facilities should have high enough annual energy usage and cost to generate enough savings opportunities for the necessary cash flow to pay back all project costs over the contract term.

6. ***Source of funds:*** bonds, tax-exempt lease, commercial lease, ESCO corporate fund, or line of credit, etc.

7. ***Interest rate/required rate of return:*** the rate of return at which the sum of discounted future cash flows equals the initial investment outlay. Most government and private sector organizations set internal return rates that gauge the useful life of an improvement and incorporates the time value of money.

Once feasibility of the project is determined, the municipality can choose the bidding process to use. Using the **RFQ method (11I)**, an agency issues a document that states its goals and objectives for the contract and describes the facilities involved, such as the number of buildings, location, and square footage. Various ESCOs respond with proposals detailing their capabilities. Agency staff evaluates the respondents and selects the best qualified ESCO to perform a detailed investment grade energy audit. Through the audit, the ESCO selects appropriate energy-conservation measures, determines the cost and the expected savings, and develops a proposal including the scope of work and all the financial details.

The **RFR method (11c)** contains all the elements of the RFQ except that the competing ESCOs must complete a preliminary energy audit, including the scope of work, estimated project cost and the preliminary savings figures in their response. (This requires the ESCO to commit its resources on a speculative basis at a substantial cost to the company.) Agency staff evaluates the respondents, selects the response with the best value, and then the ESCO performs a detailed investment grade energy audit.

MASTERING THE UTILITY TRACKING NIGHTMARE

If you are like most people, reviewing and paying utility bills is about as enjoyable as filling out your personal income tax return. For Local and State agencies, utility bills are both a major headache and a potential resource to help manage escalating utility costs — both a nightmare to deal with and a critical element in any good energy cost management strategy.

With this in mind, Rebuild Massachusetts asked our contractor Peregrine Energy Group to provide an online utility bill system to help Rebuild Massachusetts partners collect and organize utility bills. Work began on the project in the fall of 2005 with a small-scale pilot project and expanded to a statewide initiative in 2006 with generous support from US DOE, EOEA, DHCD, and four major utility companies NSTAR, NGRID, WMECO, and KeySpan. Following is a description of the project and three examples that explain how the project works.

Agencies need energy information to:

- ***Benchmark energy and water use and cost***
- ***Identify priority targets for efficiency investments***
- ***Collect and organize utility data for energy performance contracts or similar energy investment projects***
- ***Monitor and verify energy use and cost***
- ***Answer important questions such as: "how much did we pay to heat our buildings this year," "which buildings use the most energy," "how much energy did we save this year," and "did our energy costs increase because we are using more or because the price went up?"***

The Problem

Utility bills are the primary source of energy use and cost information for Local and State agencies. Other than accounting departments, most agency and department managers lack access to utility bill information. Without access to comprehensive, up-to-date, energy usage and cost information these managers cannot analyze, procure, or control energy use efficiently. Agencies need energy information to:

- Benchmark energy and water use and cost
- Identify priority targets for efficiency investments
- Collect and organize utility data for energy performance contracts or similar energy investment projects
- Monitor and verify energy use and cost
- Answer important questions such as: "how much did we pay to heat our buildings this year," "which buildings use the most energy," "how much energy did we save this year," and "did our energy costs increase because we are using more or because the price went up".

The barriers to obtaining and using energy information, however, are significant. Typically utility companies mail individual utility bills for each account. The utility bills come from multiple sources, at multiple times during the month, and in inconsistent formats. Agencies then forward the utility bills to their accounting departments for payment. Other than initial review of the utility bills for payment, utility bill information is simply not available for agency and department managers to perform good energy management analysis and review.

The Solution

So what is the solution? The Rebuild Massachusetts online Energy Information System (EIS) helps our Partners answer important energy-related questions and manage their utility bill information more efficiently. To answer your highest priority energy questions, you can customize this web-based energy information system with simple web-based tools. The system is designed to:

- Download most utility bill information ***electronically*** from electric and gas utility companies
- Help organize water, oil, and any other utility bill information that is entered manually
- Integrate utility billing and usage data with building and energy end-use information
- Integrate utility billing and usage data with building and equipment performance
- Make utility bill and building performance information easily accessible to any staff with access to the Internet
- Provide standard and custom reporting formats for multiple sources of utility bill information

Following are examples from three different end users with sample screen-prints from the EIS website.

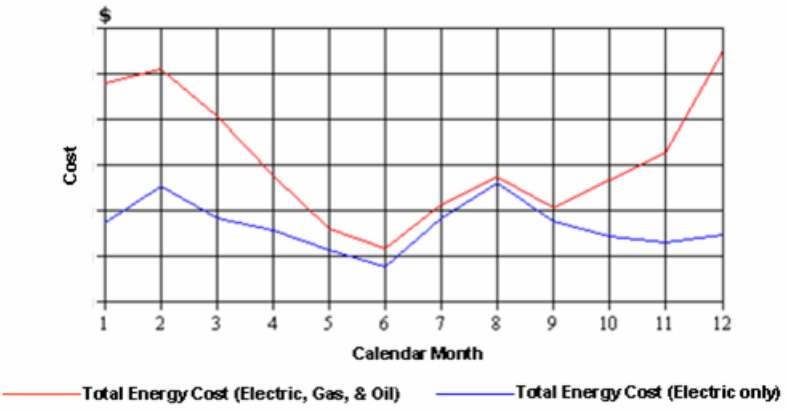
Example 1:

With limited internal resources to reduce energy costs, energy and facility managers need to identify areas where they can get the biggest cost reduction bang for the buck in their building portfolios.

Figure 1 is a screen shot from the EIS of total energy use cost data for one year for a group of buildings. Looking at this data, you can see that electricity cost peaks in the summer months, but overall energy costs *(which include both gas and oil used for heating)* are much higher in the winter.

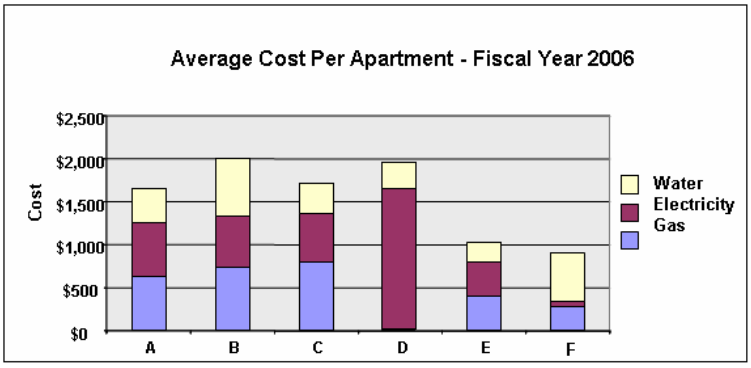
This information suggests that heating cost control is the best opportunity to reduce the total utility costs. In addition, summer-related electric cost control is a high priority.

Figure 1: Total Annual Energy Cost



Using this information the energy or facilities manager and other decision makers will understand that the first priority to reduce total utility costs is to reduce heating fuel price and heating-related fuel consumption. Summer time electricity cost and consumption reduction will be a close second priority.

Figure 2: Total Cost per Apartment



Example 2:

Figure 2 is a spreadsheet graph created for a Housing Authority (that manages both Federal-funded and State-funded housing developments) that shows one year of natural gas, electricity, and water cost data collected from the EIS sorted by cost per apartment for each utility. This graph is particularly useful for housing authorities because it answers two questions:

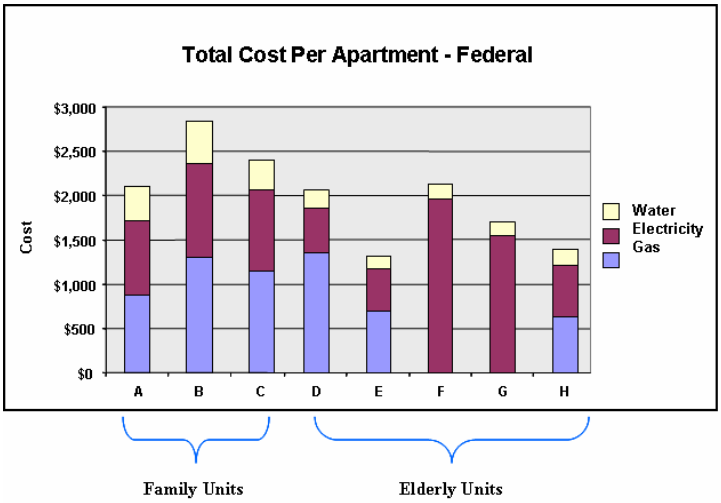
1. What is the total cost per apartment for each development it manages?
2. What is the breakdown of the utility costs for each development?

For example, developments B and D have the highest utility costs per apartment. Development B has a higher water cost per apartment and Development D has a high electricity cost per apartment. Using this information the housing authority can prioritize water cost saving measures in development B and electricity cost saving measures in development D.

Example 3:

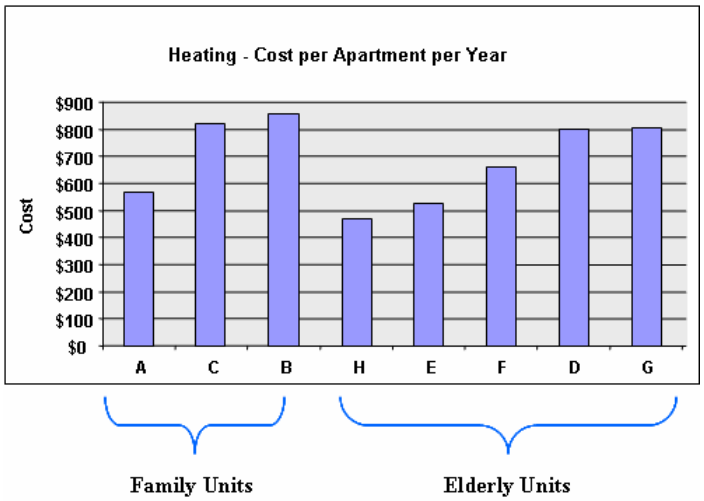
Figure 3 is a similar spreadsheet graph created for another Housing Authority. This Authority requested that Peregrine perform the HUD required energy audit for their Federal facilities. To demonstrate the benefit of the EIS to facilitate utility data collection for future energy audits, Peregrine collected the utility bill information using the EIS as part of the energy audit process. This Authority benefits **twice** from the energy audit — first, they will able to use the energy audit report as a blueprint for future energy & water efficiency investments, and second, they will be able to review the historic utility consumption collected online & update future data.

Figure 3: Total Utility Costs



Similar to the graph in figure 2, the graph in figure 3 answers the same two questions. A - C has larger apartments with families and D-H has smaller apartments with elderly residents.

Figure 4: Total Annual Heating Cost



As expected, the graph confirms that water costs per apartment are higher in the "family" developments and lower in the "elderly" developments. Interestingly, however, the water price per hundred cubic feet in this town is low – about $3.40 per HCF so the water cost is a smaller percentage of the total utility cost than the previous housing authority with a water price of about $6.50 per HCF. Water cost saving measures in this town will be less cost effective than in other towns with higher water costs.

Figure 4 is a spreadsheet graph for the same housing authority. The graph shows one year of natural gas and electricity cost information from the EIS sorted by the estimated cost to heat each development per year. Developments D & E are constructed exactly the same except for the type of heating system. The utility data generated by the EIS suggests that the housing authority could save a lot of money - $300 per apartment per year - if it installed a more efficient burner in D.

Peregrine used similar results for the EIS utility data to demonstrate which domestic hot water systems, electrical equipment, and water consumption devices were more efficient or less efficient.

City of Cambridge

Last January during the height of the gas price crisis Ellen Katz of Cambridge Department of Public Works called Eileen McHugh at DOER for some guidance regarding utility bill monitoring options. The City Manager had requested a bottom line answer to how much the City was paying for energy in all its properties. Ellen faced the challenge of collecting utility bills from all the different city agencies to answer the Manager's question. She understood the amount of work required to collect useful utility bill information because she had been creating her own spreadsheets of utility bill information for DPW managed accounts. Eileen suggested that Cambridge consider using Rebuild's EIS and provided a small cost share to help pay for the initial project start up.

Since that time Rebuild's contractor, Peregrine Energy Group, has worked closely with the City of Cambridge to collect over 20,000 gas and electric utility bills online for all of Cambridge's departments. The system development is nearing completion, with a final data verification occurring prior to going live. The City will use the EIS system to prepare the FY08 energy budget, to prioritize its properties for energy efficiency projects and to track savings from completed projects. The system offers a painless way to manage the City's energy programs.